

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization  
International Bureau



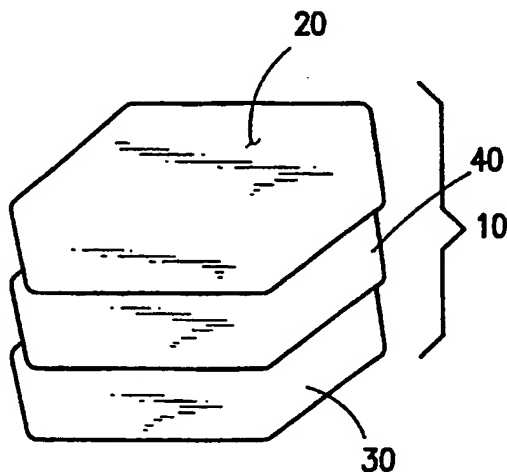
(43) International Publication Date  
23 August 2001 (23.08.2001)

PCT

(10) International Publication Number  
WO 01/60304 A1

- (51) International Patent Classification<sup>7</sup>: A61F 13/84
- (21) International Application Number: PCT/US01/04556
- (22) International Filing Date: 14 February 2001 (14.02.2001)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
60/182,197 14 February 2000 (14.02.2000) US
- (71) Applicant (for all designated States except US): U.S. ARMY INSTITUTE OF SURGICAL RESEARCH [US/US]; 3400 Rawley E. Chambers, Bldg. 3611, Fort Sam Houston, TX 78234-6315 (US).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): WALKER, Steven, C. [US/US]; 709A Ridgeside Drive, Baldwin, MO 63021 (US). WEESNER, Kathryn, A. [US/US]; 2622 Century Ranch, San Antonio, TX 78251 (US). CARTER, Todd, E. [US/US]; 3279 Lagunita Circle, Fairfield, CA 94533 (US). SHEPHERD, John, M. [US/US]; 9210 Marymont Park, San Antonio, TX 78217 (US).
- (74) Agent: U.S. ARMY MEDICAL RESEARCH AND MATERIEL COMMAND; Office of the Staff Judge Advocate, Attn: MCMR-JA (Ms. Elizabeth Arwine), 504 Scott Street, Fort Detrick, MD 21702-5012 (US).
- (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).
- Published:  
— with international search report
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: DIAPER CHANGING PAD



(57) Abstract: A diaper changing pad preferably includes a top sheet, a bottom sheet, and a liquid-absorbent region between the top and bottom surfaces. The top sheet preferably is permeable to liquid. The bottom sheet preferably is impermeable to liquid. The bottom sheet also preferably includes traction bumps along the bottom side to prevent the diaper changing pad from sliding.

WO 01/60304 A1

**DIAPER CHANGING PAD****I. Technical Field**

This invention relates to a protective pad that can be placed beneath, for example, an infant during diaper changing, a patient during a hospital stay or doctor's visit, or a resident of a nursing home.

**II. Background Art**

When changing a diaper of an infant, it is customary to lie the infant down on his back on a horizontal support surface, which may be a changing table, a bed, a crib, a car seat, a floor, the ground, or any other convenient surface. Depending upon the nature of the surface, it may be desirable to prevent direct contact between the infant and the support surface to avoid contamination of the support surface by the infant or the diaper, to prevent the infant from contamination by the support surface, or to increase the comfort of the infant, because the surface may be cold, hard, wet, or otherwise unpleasant to the touch.

Present pads are prone to slide and skid across surfaces when there is no friction between the surface and the pad. Surfaces that fall into this category are, for example, countertops in restrooms, tile or wood floors, and wet grass; and it these types of surfaces that babies are changed on. Additionally, typically when patients visit doctor's office they sit upon paper that rests against a slick surface bench. For a typical visit, the paper is a sufficient barrier between the patient and the bench; however, the paper is not sufficient to absorb any bodily fluid that might fall on it. Current medical pads, such as chucks, tend to slide when placed upon slick surfaces, because of the lack of friction.

**III. Disclosure of the Invention**

The present invention provides a diaper changing pad suitable for placement beneath an infant on a support surface during changing of the infant's diaper to prevent contact between the infant/diaper and the support surface.

The present invention also provides a comfortable pad for an infant to lie on during diaper changing or for a patient who is bed ridden.

The present invention also provides a pad that will not easily slide on a support surface.

The present invention further provides a method of employing a diaper changing pad.

According to one aspect of the present invention, a pad includes a top sheet, which is permeable to liquid, a bottom sheet, and a liquid-absorbent region between the top and bottom sheets. In a preferred embodiment, the bottom sheet is impermeable to liquid. The bottom sheet has a plurality of projections, such as bumps, for resisting sliding of the pad on a support surface. The projections make the pad safer to use and also help to prevent the pad from bunching up during use. The top and bottom sheets and the liquid-absorbent region may include the same material, but in a preferred embodiment, the pad includes a composite in which the top and bottom sheets are formed separately from the liquid-absorbent region.

According to another aspect of the present invention, a pad has a top sheet, a bottom sheet, first and second lengthwise ends, and a width, which is greater between the lengthwise ends than at the lengthwise ends. Such a shape provides extra width around the waist of the baby and/or patient, and thereby providing extra coverage for the area that may produce the most liquid or other bodily matter.

According to a further aspect of the present invention, a method of changing a diaper includes placing an infant on a changing pad having a top sheet which is permeable to liquid, a bottom sheet with bumps, and a liquid-absorbent region between the top and bottom sheets. The infant's diaper is then changed while the infant lies on the changing pad. The changing pad may then be discarded after the diaper is changed.

A changing pad according to the present invention is particularly suited for use when changing diapers, but can also be employed in a variety of other ways. For example, it can be used beneath a patient in a hospital when a dressing protecting a wound is being changed, it can be placed beneath a patient who is using a bed pan, or it may be used as a general purpose protective surface on which to place an infant, an adult, or an animal in order to prevent contact by or of the infant, adult, or animal with a surface such as a bed or a table.

#### **IV. Brief Description of the Drawings**

Figure 1 is a top plan view of an embodiment of a changing pad according to the present invention.

Figure 2 is an exploded isometric view of the embodiment of Figure 1.

Figure 3(a)-(g) illustrate alternative bottom plan views of the embodiment of Figure 1. Figure 3(h) illustrates an alternative side view of the embodiment of Figure 1.

Figure 4(a)-(d) depict alternative shapes and bottom plan views of the invention.

#### **V. Best Modes for Carrying Out the Described Embodiments**

Figures 1-3(h) illustrate an embodiment of a diaper changing pad 10 according to the present invention. The illustrated embodiment includes a top sheet 20 for supporting an infant during diaper changing and a bottom sheet 30 which can rest on a table, a bed, or other support surface during diaper changing. The pad 10 may have

any desired shape as viewed in plan that enables it to support a desired region of an infant's body, such as rectangular, polygonal, oval, circular, or other shape as illustrated in Figures 4(a)-(d). The pad 10 may have any desired dimensions. Preferably, the pad 10 is large enough to support the entire body of the baby and/or patient. There is no upper limit on the size of pad 10.

The illustrated pad 10 preferably is hexagonal with a width that increases linearly from the lengthwise ends 12, 14 of the pad 10 towards its lengthwise center. The two lengthwise ends preferably have the same width, and the region of greatest width preferably is midway between the two lengthwise ends 12, 14. A hexagonal shape is advantageous because it increases the width of the pad 10 approximately where the baby and/or patient's waist is located. Preferably, the pad 10 will be manufactured to have sufficient length to provide a barrier for the full height of the baby and/or patient. Alternatively, the pad 10 may be rectangular instead of hexagonal shape as illustrated in Figure 4(a).

The top sheet 20 of the pad 10 is preferably highly permeable to urine or other aqueous fluids. The pad 10 preferably includes an absorbent region 40 between the top and bottom sheets 20, 30. The absorbent region 40 preferably absorbs liquids which permeate the top sheet 20. The top sheet 20 of the pad 10 may simply be the top surface of the material forming the absorbent region 40. In many cases, it is convenient if the top sheet 20 and the absorbent region 40 are made of different materials, since a material having good absorbency (a desirable property for the absorbent region 40) may not have good resistance to abrasion (a desirable property for the top sheet 20) and may tend to wear under contact with an infant.

In the present embodiment, the top sheet 20 is formed separately from the absorbent region 40. The top sheet 20 may be made of a wide variety of liquid

permeable materials, such as meshes, moisture permeable webs, woven or non-woven fabrics that are sufficiently porous to permit liquids to pass therethrough, or films having pores or other openings through which liquid can readily pass. The top sheet 20 is preferably tough enough not to abrade during use but smooth enough not to irritate the skin of an infant and/or a patient lying on the pad 10. Fabrics used as facing materials for conventional disposable diapers are particularly suitable for the top sheet 20. Also, it is preferable that the top sheet 20 provides a separation barrier between the infant and the liquid in the absorbent region 40.

The characteristics of the absorbent region 40 can be selected based on the amount of liquid, which is expected to enter this region 40 through the top sheet 20 during diaper changing. Any material having the desired absorbency can be employed, with materials employed for the absorbent panels of conventional disposable diapers being particularly suitable. In the present embodiment, the absorbent region 40 preferably has a dry uncompressed thickness of approximately 0.06 to 0.25 inches, and more preferably the dry uncompressed thickness is about 0.125 inches. Preferably, the absorbent region 40 material will expand as liquid is absorbed.

The bottom sheet 30 of the pad 10 may simply be the bottom surface of the absorbent region 40. More preferably, the bottom sheet 30 is a separate layer having different properties from the absorbent region 40, for example, to protect the absorbent region 40 against abrasion from the underlying surface and/or to prevent the passage of liquids through the bottom sheet 30.

In the present embodiment, the bottom sheet 30 is formed separately from the absorbent region 40 and extends over the entire surface area of the bottom of the absorbent region 40. The bottom sheet 30 preferably has a low permeability to liquid so that liquid in the absorbent region 40 or liquid contacting the outer surface of the

bottom sheet 30 will not readily pass through the bottom sheet 30. The degree of liquid permeability may depend upon the environment where the pad 10 is to be used. For example, if the pad 10 needs to be used in an environment that is damp such as outdoors or at a swimming pool, a material such as a plastic membrane which is substantially impermeable to liquid may be suitable. If the pad 10 is intended for use in drier settings, a higher degree of permeability, such as that possessed by woven or non-woven fabrics may be acceptable. Materials used as the backings for conventional disposable diapers generally have satisfactory properties.

In order to prevent the pad 10 from sliding with respect to a changing table or other support surface on which it is placed during diaper changing, the bottom sheet 30 of the pad 10 preferably is formed with members which increase the grip of the bottom sheet 30 against a surface on which it rests. In the present embodiment, the bottom sheet 30 preferably includes a plurality of projections in the form of round bumps 32 to improve its grip, and thus increase the frictional forces between the pad 10 and the support surface. The bumps 32 preferably are integrally formed with the bottom sheet 30. Alternatively, the bumps 32 may be separately formed and then joined to the bottom sheet 30 by bonding or other suitable method; and in this alternative it is preferable that the bumps 32 are rubber, silicon, or other similar material.

Other possible shapes for projections for increasing the grip include ridges 33 (Figures 3(c)-(e), 4(b), (d)), suction cups 34 similar to the underside of shower mats (Figure 3(f)), raised bumps, needle-like shapes, or a pattern of string appendages 35 (Figure 3(h)) similar to a field of grass. The bumps 32 may be arranged in a regular array or in any other desired pattern. The projections on the bottom of the bottom sheet 31 may be arranged in a variety of ways as illustrated in Figures 3(a)-(g) and 4(a), (c).

Additionally, the projections may be different sizes to each other such that there may be small projections and large projections both used. As illustrated in Figure 4(a), the bumps 32 may be more concentrated in the central area and sparser towards the ends and/or sides. Figure 4(b) illustrates a combination of straight ridges 33 and curved ridges 33 such as sinusoidal curves. Figure 4(d) provides an example of a spiral ridge that may maintain the same distance between neighboring ridge portions or alternatively may have varying distances between neighboring ridge portions across the bottom sheet 30. Preferably, the projections will be formed in a regular recurring pattern to ease manufacture of the pad 10. The bumps 32 not only increase the safety of the pad 10 by immobilizing it with respect to a support surface, they also help to maintain the pad 10 in a smooth and unwrinkled state by preventing shifting of different portions of the pad 10 with respect to each other during diaper changing.

It may be desirable to seal the outer periphery of the pad 10 to prevent liquid, which enters the absorbent region 40 from leaking to the outside of the pad 10 through the periphery. In the present embodiment, the bottom sheet 30 preferably is somewhat larger in area than the top sheet 20 and the absorbent region 40 so that it can be folded over to the top side of the top sheet 20 and then be secured in place to seal the outer periphery of the pad 10. The folded over portion of the bottom sheet 30 may be secured in place by bonding with, for example, an elastic or inelastic adhesive, stitching, riveting, heat sealing, sonic sealing, or any other desired method.

Another way to seal the outer periphery of the pad 10, without folding over the bottom sheet 30, is to run a bead of adhesive around the periphery to join the different layers to each other. An alternative to gluing/bonding the two sheets together is to stitch, rivet, heat seal, or sonically seal the two sheets together. Preferably, the top sheet 20 and the bottom sheet 30 are equal size and larger such that the absorbent



region 40 is nested within the area between the top sheet 20 and the bottom sheet 30.

The different layers may also be joined to each other in locations other than along the periphery of the pad 10 by bonding, stitching, riveting, interlocking of the fibers in adjoining layers, or other methods.

The pad 10 is preferably flexible so that prior to use, it can be stored in a rolled-up or folded-up state. When it is to be discarded, it can then be rolled or folded into a compact shape.

#### **VI. Industrial Applicability**

In order to use the pad 10 for changing an infant's diaper, the pad 10 is spread out on a table or other support surface with the bottom sheet 30 of the pad 10 facing the support surface and the infant lying atop the top sheet 20 of the pad 10. The diaper can then be replaced in the customary manner. Any fluids which are discharged from the infant or which leak from the diaper during diaper changing preferably pass through the top sheet 20 of the pad 10 and preferably are absorbed by the absorbent region 40 while being prevented from reaching the support surface by the bottom sheet 30. At the same time, any liquids on the top of the support surface preferably are prevented by the bottom sheet 30 from contacting the infant. When diaper changing is completed, the infant can be removed from the pad 10, and the pad 10 can be discarded, preferably after a single use. Even if the infant is left on the pad 10 for some time, any fluids discharged during diaper changing will be absorbed by the absorbent region 40, and the top sheet 20, which the infant contacts, will remain dry, so the infant will feel no discomfort from the presence of liquid in the absorbent region 40.

The pad 10 can be used in a similar manner as detailed in the method for changing a baby's diaper in a hospital environment when changing dressings, using bedpans, drawing fluid from or administering fluids to a patient, or in other procedures

involving possible contamination. The primary change is that the patient is more likely to lie on the pad 10 for extended periods of time than a baby whose diaper is being changed.

Those skilled in the art will appreciate that various adaptations and modifications of the above-described preferred embodiments can be configured without departing from the scope and spirit of the invention. Therefore, it is to be understood that, within the scope of the appended claims, the invention may be practiced and constructed other than as specifically described herein.

We claim:

1. A pad comprising:  
a top sheet, said top sheet is permeable to liquid,  
a bottom sheet with protrusions, and  
a liquid-absorbent region between said top and bottom sheets; and  
wherein said protrusions are on a side of said bottom sheet opposing said liquid-absorbent region.
2. The pad as claimed in claim 1, wherein said top sheet and said bottom sheet each have first and second lengthwise ends and a width which is greater between the lengthwise ends than at the lengthwise ends.
3. The pad as claimed in claim 2, wherein the width varies linearly along a length of the pad.
4. The pad as claimed in claim 2, wherein the first and second lengthwise ends are equal in width.
5. The pad as claimed in claim 2, wherein the width is a maximum midway between the two lengthwise ends.
6. The pad as claimed in claim 1, wherein said protrusions include a plurality of ridges extending from said bottom sheet.

7. The pad as claimed in claim 1, wherein said protrusions include a pattern of raised bumps on said bottom sheet.

8. The pad as claimed in claim 1, wherein said protrusions include a pattern of suction cups extending from said bottom sheet.

9. The pad as claimed in claim 1, wherein said protrusions include a plurality of string members extending from said bottom sheet.

10. A pad comprising:  
a top sheet for supporting a person,  
a bottom sheet having a plurality of projections for resisting sliding of said pad,  
and  
an absorbent region between said top sheet and said bottom sheet; and  
wherein said plurality of projections are on a side of said bottom sheet opposing said absorbent region.

11. The pad as claimed in claim 10, wherein the projections are at least one of bumps, ridges, and needles.

12. The pad as claimed in claim 10, wherein the bottom sheet is impermeable to liquid.

13. A pad comprising:
- a top sheet, said top sheet is permeable to liquid;
  - a bottom sheet, said bottom sheet is impermeable to liquid, said bottom sheet having projections along one surface; and
  - a liquid-absorbent region disposed between the top and bottom sheets; and
- wherein said region on a surface of said bottom sheet opposite the surface with the projections.
14. The pad as claimed in claim 13, wherein said top sheet includes a non-woven fabric.
15. The pad as claimed in claim 13, wherein the top sheet includes a mesh.
16. The pad as claimed in claim 13, wherein said projections include a plurality of ridges extending from said bottom sheet.
17. The pad as claimed in claim 13, wherein said projections include a pattern of raised bumps on said bottom sheet.
18. The pad as claimed in claim 13, wherein said projections include a pattern of suction cups extending from said bottom sheet.
19. The pad as claimed in claim 13, wherein said protrusions include a plurality of string members extending from said bottom sheet.

20. A method for using the pad as claimed in claim 13 comprising:

spreading the pad out over a support surface with the bottom surface and the projections against the support surface,

placing the individual on top of the pad,

caring for the individual,

removing the individual from the pad, and

disposing of the pad.

21. A pad consisting of:

a top sheet, said top sheet is permeable to liquid;

a bottom sheet, said bottom sheet is impermeable to liquid, said bottom sheet having projections along one surface; and

a liquid-absorbent region disposed between the top and bottom sheets; and

wherein said region on a surface of said bottom sheet opposite the surface with the projections, and

said projections is at least one of a group consisting of ridges, bumps, suction cups, and string members.

1 / 4

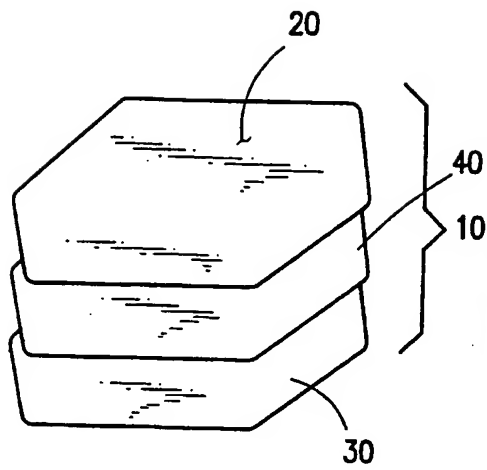


FIG. 2

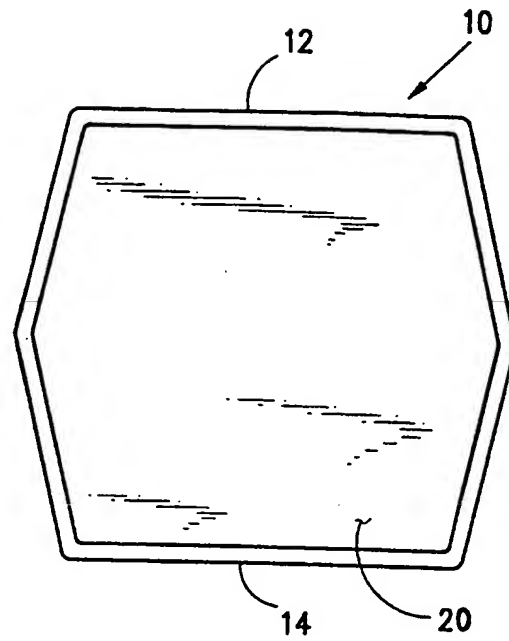


FIG. 1

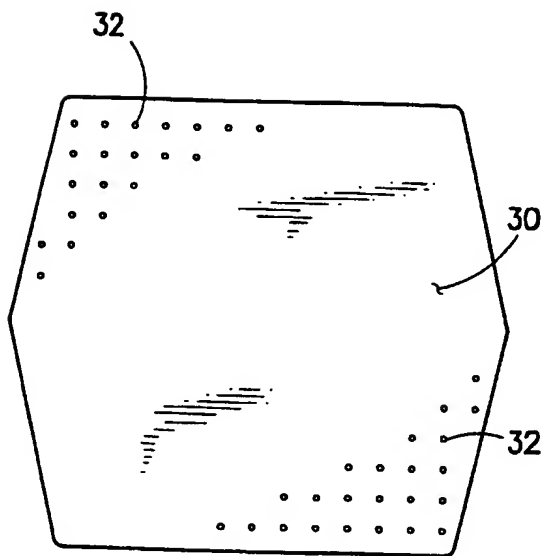


FIG. 3(a)

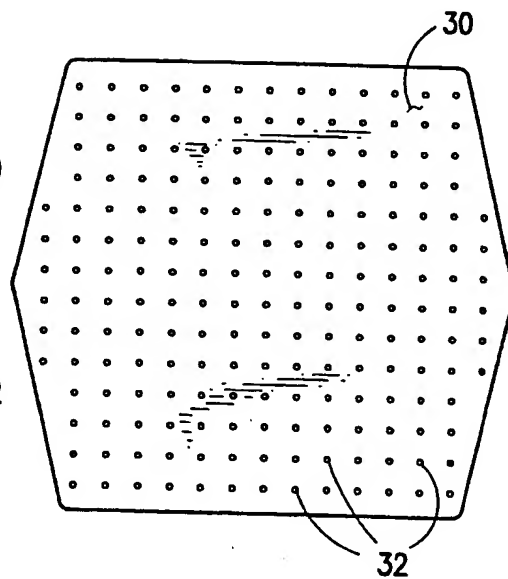


FIG. 3(b)

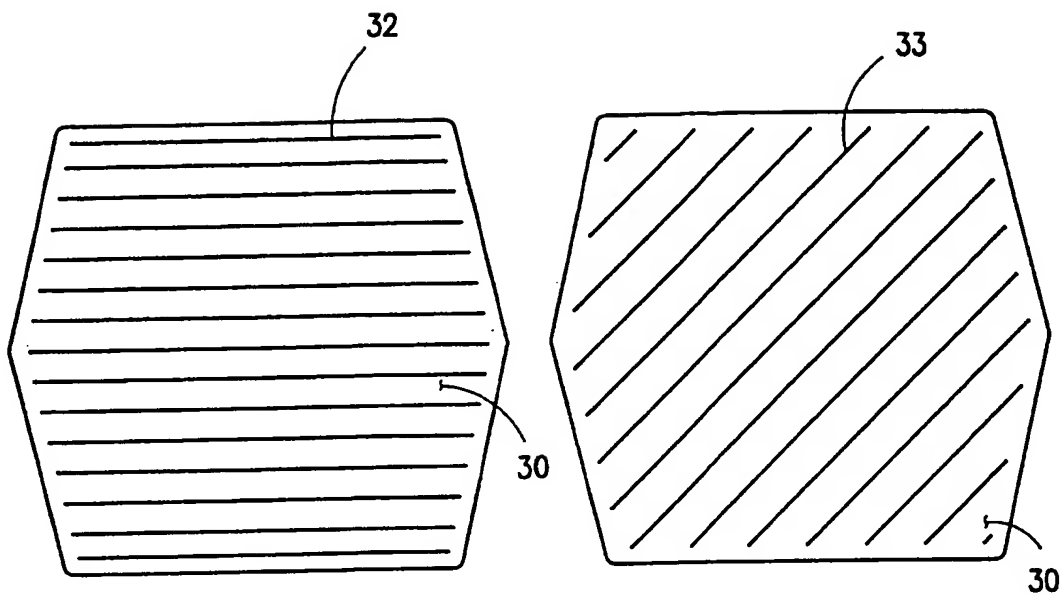


FIG. 3(c)

FIG. 3(e)

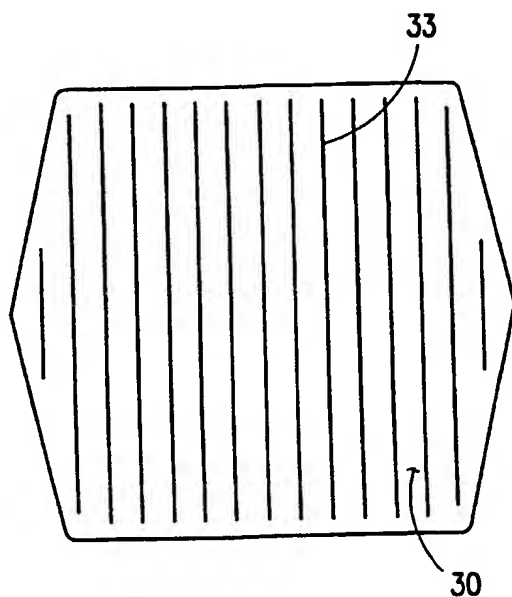


FIG. 3(d)



3/4

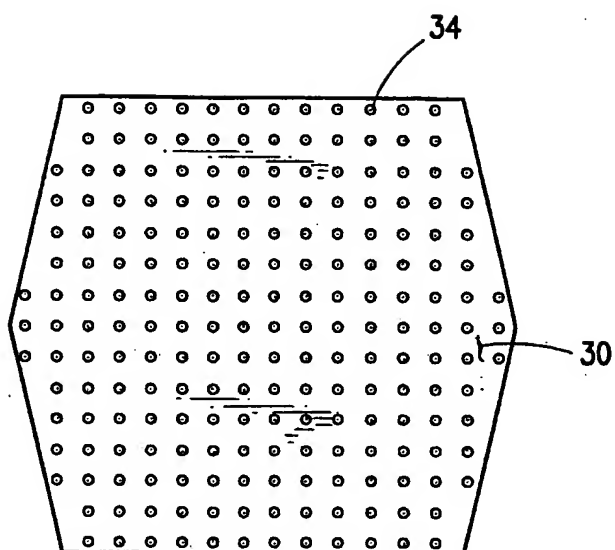


FIG. 3(f)

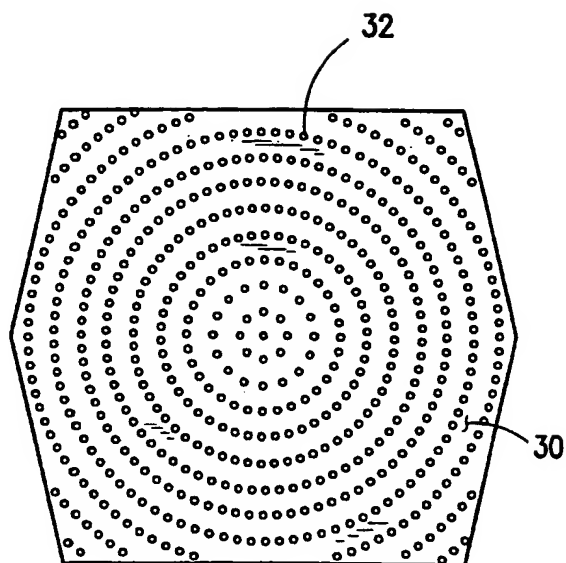


FIG. 3(g)

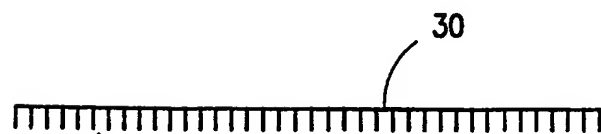


FIG. 3(h)

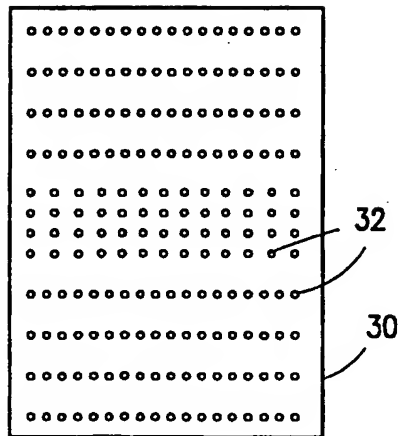


FIG. 4(a)

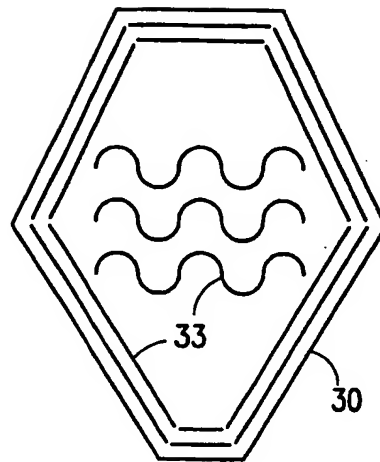


FIG. 4(b)

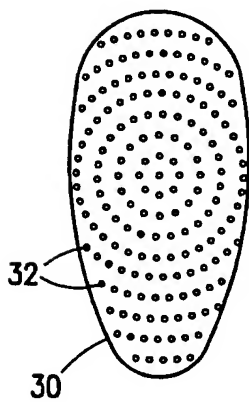


FIG. 4(c)

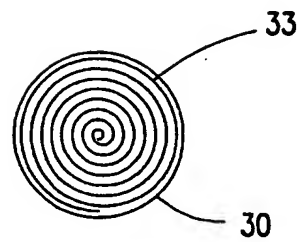


FIG. 4(d)

# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/US 01/04556

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 A61F13/84

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 A61F A61G A47D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 822 669 A (ROGA ROBERT C) 18 April 1989 (1989-04-18) the whole document	1,10, 12-14
Y	US 5 735 004 A (WOOTEN DUANE A ET AL) 7 April 1998 (1998-04-07) abstract column 3, line 3-16; figures	1,6-13, 16-21
Y	US 5 244 278 A (ROBITAILLE SUZANNE) 14 September 1993 (1993-09-14) column 3, line 3-19 column 4, line 4-7; figures	1,6-13, 16-21
A	US 4 723 300 A (ARANOW ROSALIND B) 2 February 1988 (1988-02-02) abstract; figures 2,3	1,10,13, 20,21
-/--		

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

### Special categories of cited documents:

\*A\* document defining the general state of the art which is not considered to be of particular relevance

\*E\* earlier document but published on or after the international filing date

\*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

\*O\* document referring to an oral disclosure, use, exhibition or other means

\*P\* document published prior to the international filing date but later than the priority date claimed

\*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

\*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

\*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

\*G\* document member of the same patent family

Date of the actual completion of the international search

14 May 2001

Date of mailing of the international search report

28/05/2001

Name and mailing address of the ISA  
European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Seabra, L

# INTERNATIONAL SEARCH REPORT

Int. l. Application No  
PCT/US 01/04556

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	WO 00 56260 A (ROSENBERG FRANK) 28 September 2000 (2000-09-28) page 5, line 4-23; figure 1 ----	1,6-14, 16-21
A	DE 198 35 148 C (DAIMLER CHRYSLER AG) 2 December 1999 (1999-12-02) figures ----	1,10,13, 20,21
A	US 5 133 085 A (DE PASQUALE AMICARELLI PAULA A ET AL) 28 July 1992 (1992-07-28)  column 4, line 22-46 column 6, line 3-5; figures 1,4 ----	1-5,10, 12,13, 20,21
P,A	US 6 125 487 A (IVE RONALD A) 3 October 2000 (2000-10-03) column 5, line 45-59; figures ----	1,10,13, 21
A	US 4 917 505 A (BULLARD CHERYL F ET AL) 17 April 1990 (1990-04-17)  abstract; claim 3; figures 1-3B -----	1-5,10, 12,13, 20,21

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 01/04556

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4822669 A	18-04-1989	AT 395288 B	10-11-1992
		AT 206288 A	15-04-1992
		AU 608884 B	18-04-1991
		AU 2102788 A	23-02-1989
		BE 1002864 A	09-07-1991
		CH 676950 A	28-03-1991
		DE 3827849 A	02-03-1989
		DK 463888 A	22-02-1989
		ES 2010313 A	01-11-1989
		FI 883854 A	22-02-1989
		FR 2619582 A	24-02-1989
		GB 2208796 A	19-04-1989
		GR 88100534 A,B	25-05-1989
		IT 1224713 B	18-10-1990
		JP 1131629 A	24-05-1989
		LU 87318 A	08-03-1989
		NL 8802072 A	16-03-1989
		NO 883712 A,B,	22-02-1989
		PT 88283 A,B	30-06-1989
		SE 8802913 A	17-03-1989
US 5735004 A	07-04-1998	NONE	
US 5244278 A	14-09-1993	NONE	
US 4723300 A	02-02-1988	NONE	
WO 0056260 A	28-09-2000	NONE	
DE 19835148 C	02-12-1999	EP 0978243 A	09-02-2000
US 5133085 A	28-07-1992	NONE	
US 6125487 A	03-10-2000	NONE	
US 4917505 A	17-04-1990	NONE	

